Long Answer Type Questions

[5 Marks]

Q. 1. It is desired to obtain an arect image of an object, using concave mirror of focal length of 12 cm.

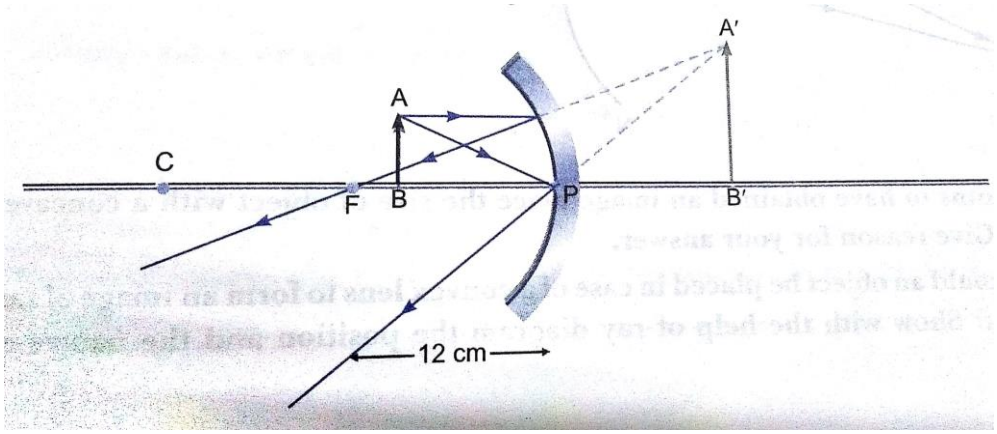
(i) What should be the range of distance of an object placed in front of the mirror?

(ii) Will the image be smaller or larger than the object. Draw ray diagram to show the formation of image in this case.

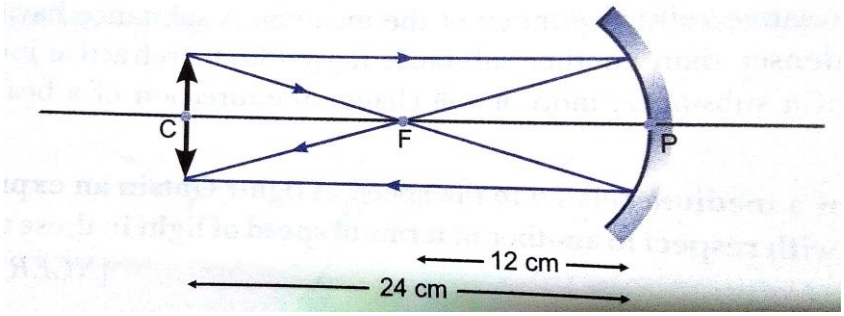
(iii) Where will the image of this object be, if it is placed 24 cm in front of the mirror? Draw ray diagram for this situation also to justify your answer. Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams.

Ans. (i) Range of distance should be 0 cm to $<$ 12 cm.

(ii) The image will larger than the object.



(iii) Image will be 24 cm in front of the mirror.



Q. 2. Suppose you have three concave mirrors A, B and C of focal length 10 cm, 15 cm and 20 cm. For each concave mirror you perform the experiment of image formation for three values of object distance of 10 cm, 20 cm and 30 cm. Giving reason answer the following:

(a) For the three object distances, identify the mirror\mirrors which will form an image of magnification – 1.

(b) Out of the three mirrors identify the mirror which would be preferred to be used for shaving purpose\makeup.

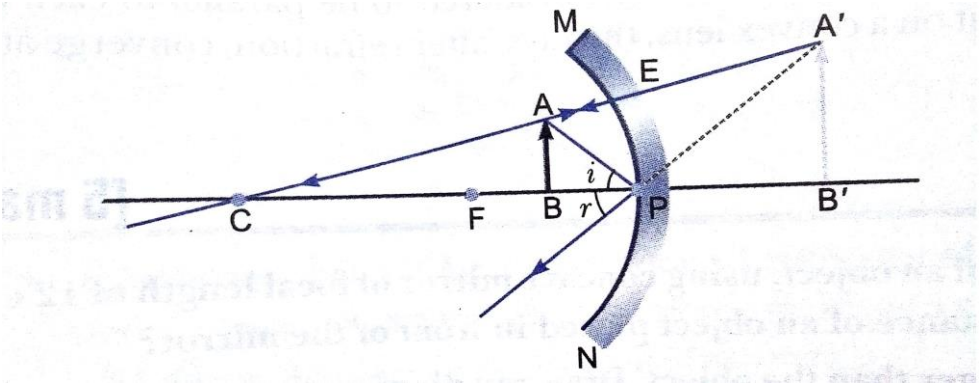
(c) For the mirror B draw ray diagram for image formation for object distances 10 cm and 20 cm.

Ans. Given, $f_a = 10$ cm; $f_b = 15$ cm; $f_c = 20$ cm
$u_1 = 10$ cm; $u_2 = 20$ cm; $u_3 = 30$ cm

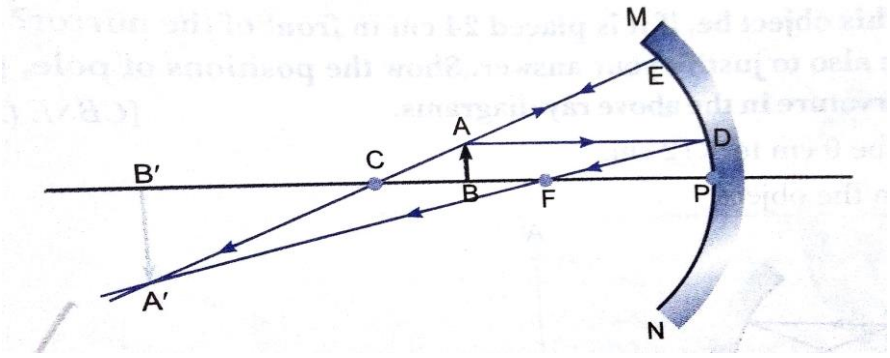
(a) m = - 1 means u = 2 f. For A it will be u_2 and for B it will be u_3.

(b) Mirror B or C can be used for shaving\makeup purposes because the distance should be less than focal length for erect and magnified image. The face is generally kept at a distance more than 10 cm from the mirror.

(c) When u = 10 cm



When u = 20 cm



Q. 3. (i) Rohit claims to have obtained an image twice the size of object with a concave lens, Is he correct? Give reason for your answer.

(ii) Where should an object be placed in case of a convex lens to from an image of same size as of the object? Show with the help of ray diagram the position and the nature of the image formed.

(iii) With the help of ray diagram, illustrate the change in position, nature and size of the image formed if the convex lens in case of (ii) is replaced by concave lens of same focal length.

Ans. (i) No, Rohit is incorrect because magnified image of an object cannot be formed by a concave lens ever.

(ii) The object should be placed at 2f.

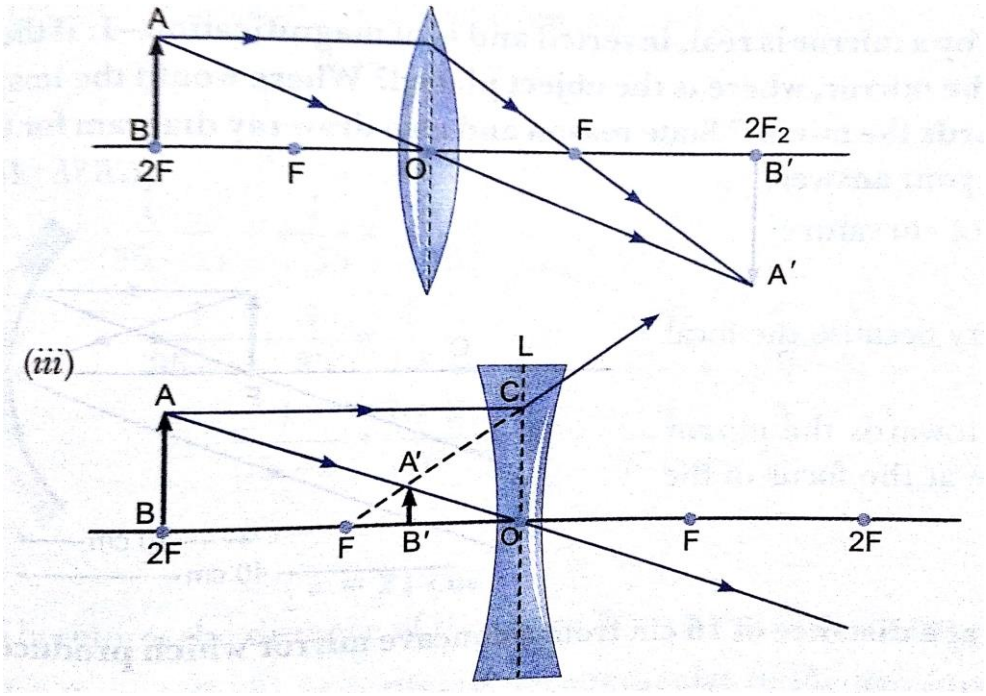


Image obtained is virtual, erect and diminished in case of concave lens.